Title

Model Predictive Control: An attempt to tell an unfinished story!

Dr. Mazen Alamir, Research Director at CNRS, Grenoble, France

Abstract

While it is true that any control design methodology is based on some modelling of the underlying dynamics, the most advanced of these techniques, namely Model Predictive Control (MPC) **cannot be conceived in the absence of such a dynamic model**. The predominant place of MPC in the control engineering landscape since the last two decades is justified by its ability to handle nonlinearities, constraints and optimality concerns on one hand and by the availability of dedicated efficient optimization solvers on the other hand. In this talk, the basics of MPC are introduced and the main related research topics are shortly and progressively discussed including among others: Stability issues, Real-time implementation, Handling uncertainties via stochastic MPC, GPU-based parallel implementation as well as appropriate use of Machine Learning based blocs. Industrial and real-life examples are used throughout the talk in order to illustrate the underlying tools and methods.

Biography

Mazen Alamir is Research Director at CNRS, Grenoble, France. He graduated in Mechanics (Grenoble, 1990) and Avionics (Toulouse 1992). He received his Ph.D. in Nonlinear Model Predictive Control in 1995 from Grenoble Institute of Technology. He served as head of the Nonlinear Systems and Complexity research group at the Control System Department, University of Grenoble-Alpes. His main research topics are model predictive control, moving-horizon observers and Blind Fault Detection in industrial equipment. He was a member of the IFAC technical committee on Nonlinear Systems as well as the IEEE Conference Editorial Board and served as Associate Editor of the IEEE Transaction on Automatic Control (2008-2021). He organized the first IFAC workshop on NMPC for Fast System, Grenoble 2006. He was a visiting researcher at the Centre for Complex Dynamic Systems and Control, Newcastle Australia 2008, 2012. He managed several industrial contracts on various topics including Cryogenics (CEA), Building Management Systems, Stirling Engine, smart district (Schneider-Electric), Power Electronics (ST-Microelectronics), Steam-Engines (SEB), Tilting Trains (ALSTOM), Automated Manual Transmission, wind turbine control (IFPEN). He is co-founder and scientific advisor of the startup Amiral-Technologies, specialized in AI algorithms for industrial predictive maintenance and diagnosis and winner of the 2017 GE-digital industrial challenge. He is author of about 300 Publications including about 90 peer reviewed journal papers, two monographies and fifteen industrial patents and software licenses.